U.S. Marine Expeditionary Rifle Squad: HSI in the Modernization Process

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PM Marine Expeditionary Rifle Squad
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Presentation For
MANPRINT Practitioner's Workshop
"Transforming for the Soldier"
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The Key Players

Identifies Needed Required Capabilities Universal Needs Statement (UNS)

Develops Concepts and Translates Needed Capabilities into Requirements Documents

GCE Advocate, Oversees OAG Process

Dollars, Acquisition, Life Cycle Management

Why Be Concerned?

- IOAG & Ground Board stressed lack of **integration** and **single** POC
  - No Vision or roadmap for the Future Marine Rifle Squad
  - No Requirements developed for integrated capabilities
  - No Acquisition single POC to develop integrated material solutions
- Fragmented prioritization of squad-oriented POM submissions
  - Competition is self-defeating
- Current programs fall short of supporting an integrated systems approach
  - Programs are ‘stove-piped’ by functional area
- Investment in equipment to support the infantry squad is sub optimized
- Human factors & integration lack systematic approach

Need: Integrated, Systematic Approach. Single POC.

The Integration Challenge

Infantry Weapons
- Modular Weapon System (MWS)

Power Systems
- Ultralife Batteries

Operation Center
- Portable Display Device
- Digital Automated Communication Terminal (DACT)
- Handheld Personnel Locator
- Small Unit Operations/Situational Awareness System (SUO/SAS)

Optics
- RCO/ACOG
- PVS-7 NVG
- PVS-17 Mini Night Vision Sight
- PVS-14 Individual Image Intensifier Night Vision
- PAS-13 Thermal Weapon Sight (TWS)

LAV, EFV, MV-22
- Mobility

Training Systems
- Indoor Simulated Marksmanship Trainer - Enhanced (ISMT-E)

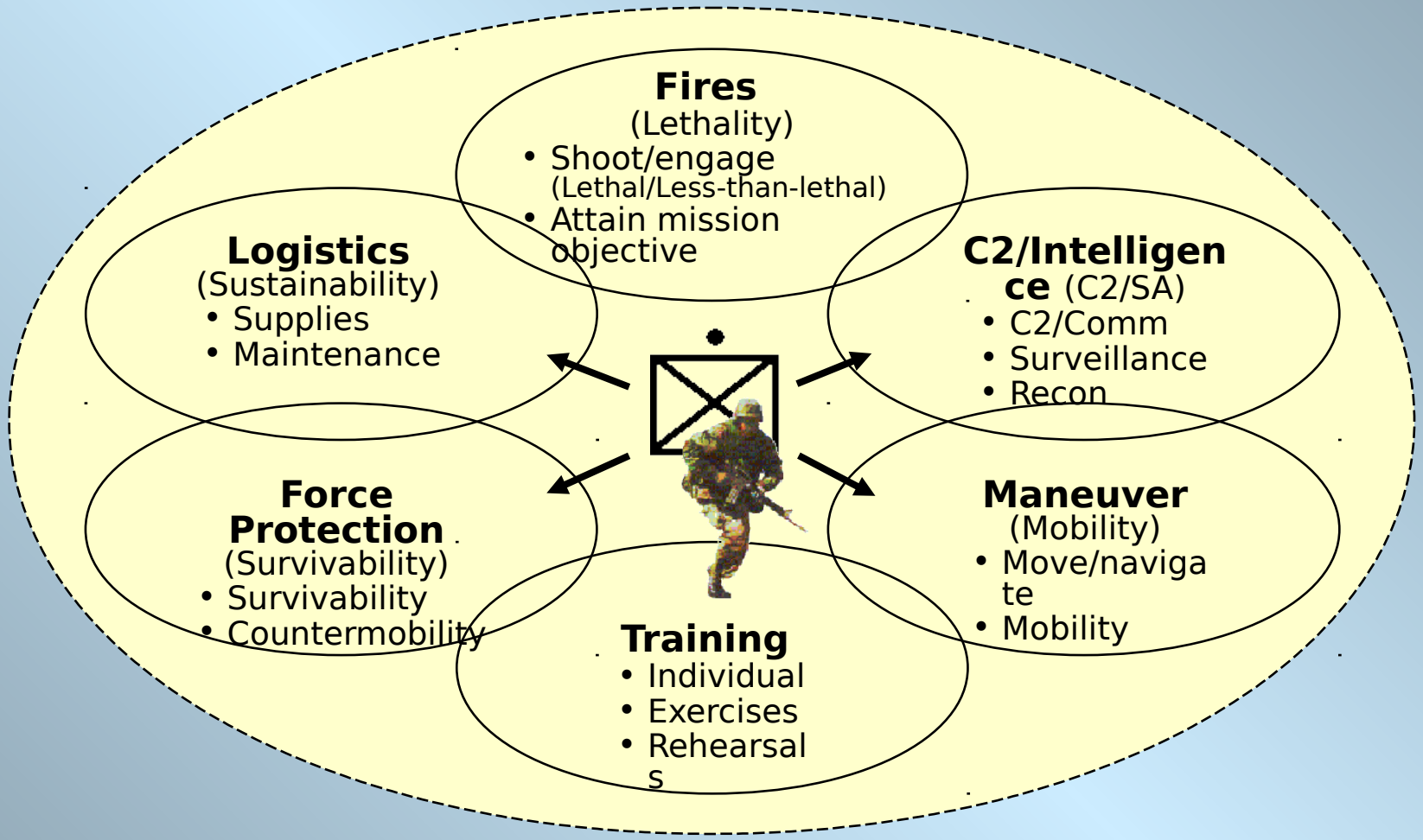
Ground C2
- PRR
- Handheld GPS Devices
- Precise Lightweight Global Positioning System Receiver (PLGR)
- Dead Reckoning Module (DRM)
- Single Channel Ground and Airborne Radio System (SINCGARS)

Infantry Combat Equipment
- All-Terrain All-Purpose Cart (ATAC)
- Modular Lightweight Load-Carrying Equipment (MOLLE)
- Interceptor Body Armor
- Raptor

NBCS
- NBC Equipment

Multiple Systems, Many Voices. Human Factors? Integration?

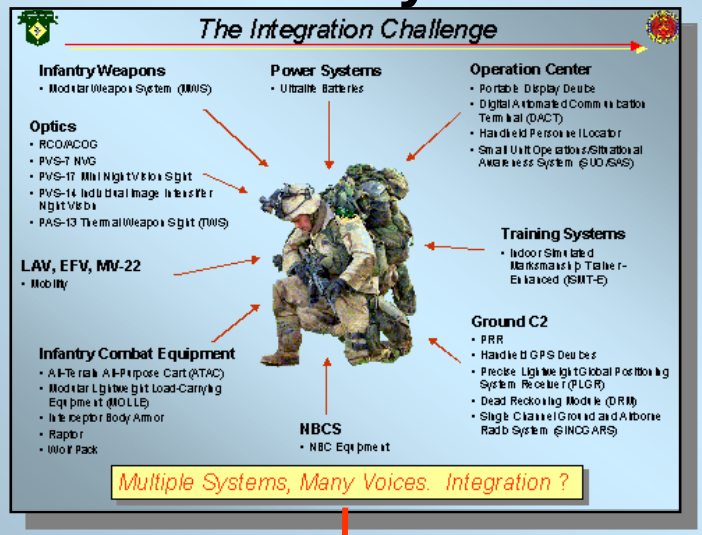
Squad as an Integrated System



Human Factors & Integration Built In One System, One Voice,

The MERS Challenge

Today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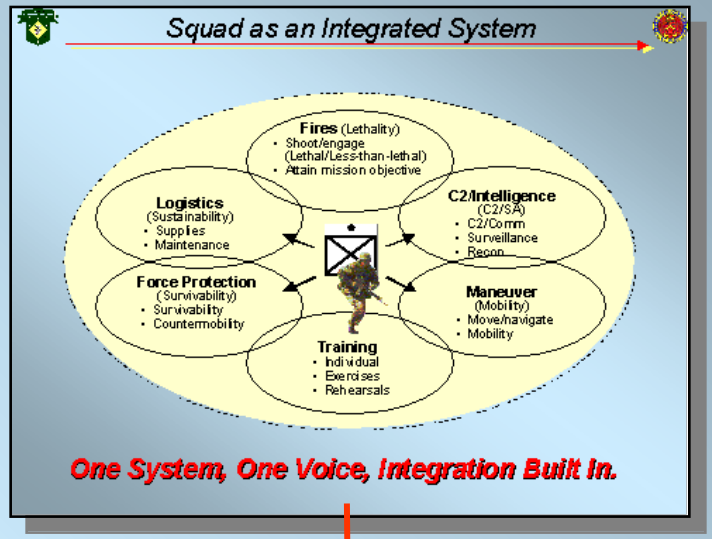
Multiple Systems, Many Voices. Integration ?

Future



Integration Added-On

- Multiple Operating Concepts
- Multiple Requirements Documents
- Multiple Acquisition Strategies
- Products Integrated After Fielding
- Human Factors Not Systematic
- Interoperability Forced in
- Process Inefficient
- Minimal Leveraging
- Infrastructure & O&M Costs
- Multiple Belly-buttons
- Discrete Performance Improvements

Integration Built-In

- Single Integrated Operating Concept
- Single Integrated Requirements Documen
- Integrated Acquisition Strategy
- Products Integrated From Inception
- Human Factors Incorporated into System
- Interoperability Built in
- Speeds Process
- Leveraging Saves Resources
- Significantly Reduced Infrastructure & O&
- One Belly-button
- System Performance Improvements

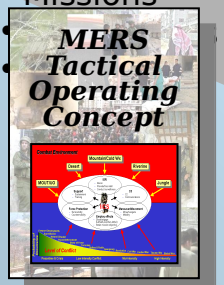
MERS … is not just equipment…

- *It's implementing strategic/operational concepts at the squad level*
- *It's a mindset, it's a philosophy, it's a culture, it's DOTMLPF*
- *And it's designed to develop a better fighting machine – the **Marine Expeditionary Rifle Squad***

Future Concep

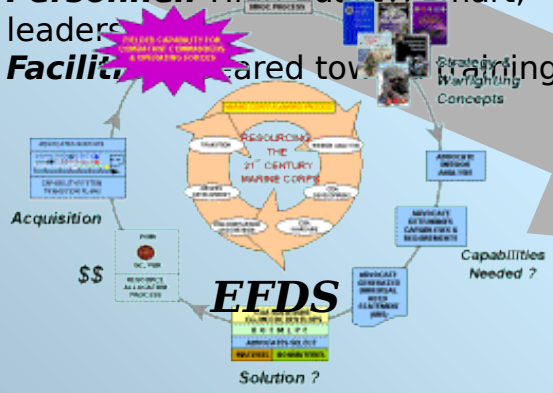
Future Squad Operating Concept

- Squad Missions
-
-



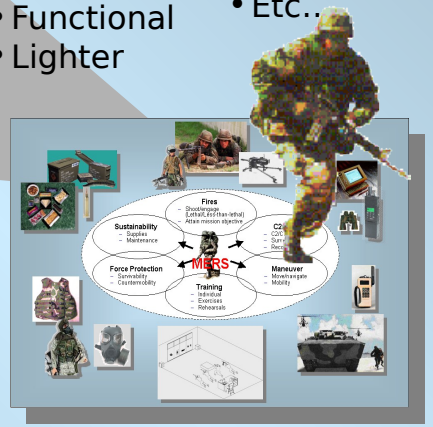
Integrated Required Capabilities

- ***Doctrine:*** Goals for future fight
- ***Organization:*** Size of basic fighting unit
- ***Training:*** How to fight
- ***Leadership & Education:*** WF Culture
- ***Personnel:*** High quality, smart, leaders
- ***Facilit…*** …ared tov… …training



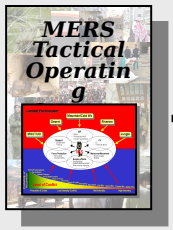
Integrated Materiel Solutions

- Effective
- Functional
- Lighter
- Integrated
- Compatible
- Etc…



MERS Systematic Approach

Integrated Squad Concept & Required Capabilities form Future Roadmap



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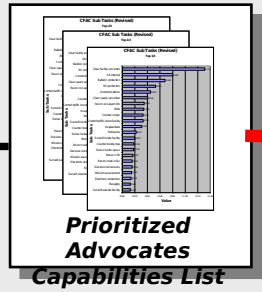


Prioritized Advocates Capabilities List

DOT M LPF

DOT_LPF

Combat Development

Guides S&T

Leveraging Technology Influences Future Programs

Other Soldier Systems

Technologies

Experimentation

Technology & Experimentation

Ties Into Future Programs

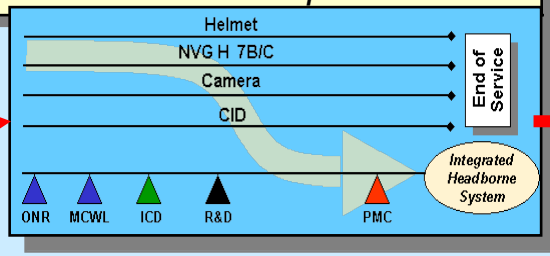
M

Legacy Systems

Current Programs

Gap Analysis & Acquisition Strategy

Portfolio Management Coordinates the Future Roadmap



Future Programs

Acquisition

OAG Periodically Adjusts Capability List

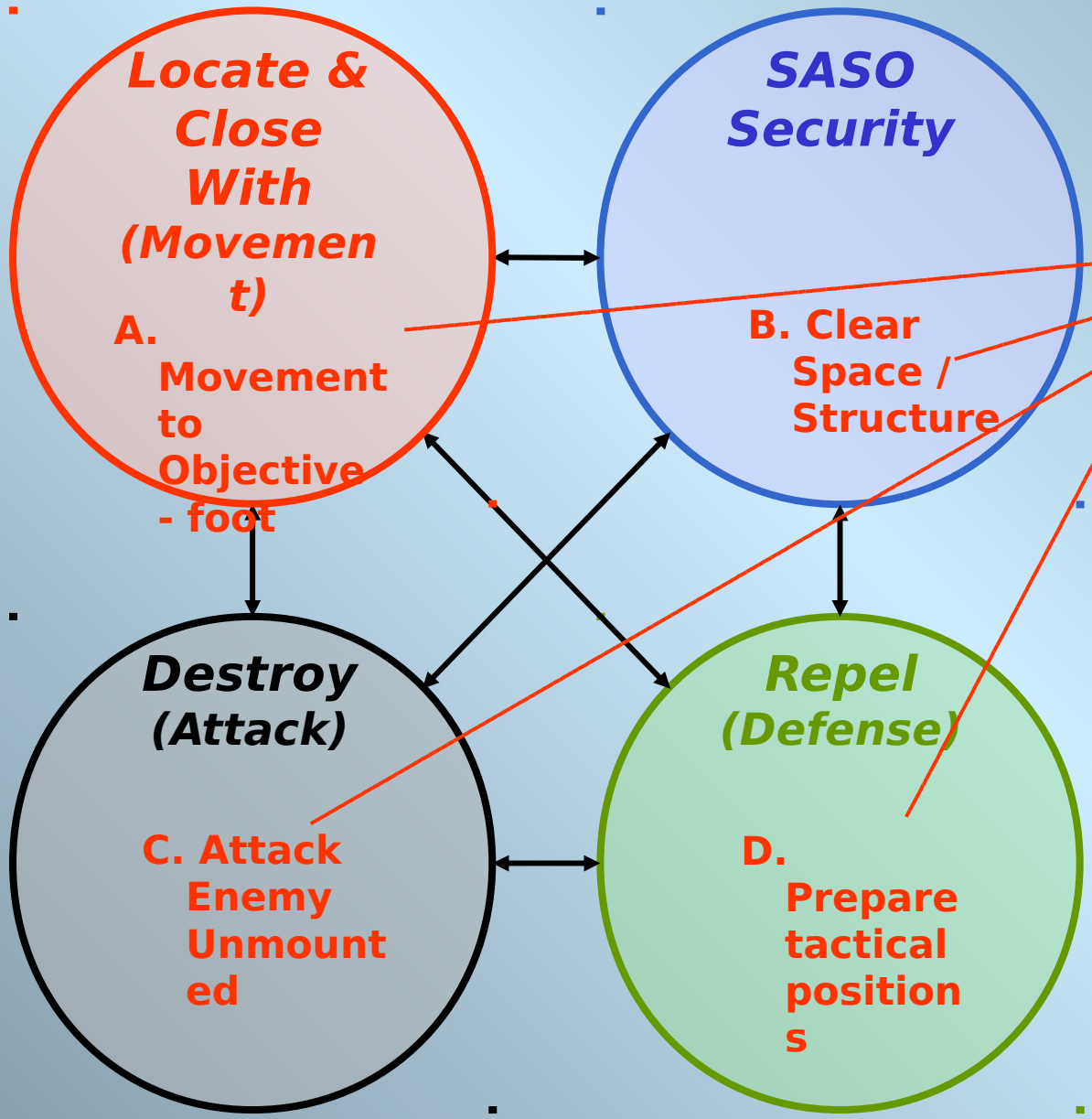
Acquisition & Life Cycle Management Ensures Support of MERS Systems

Fully Integrated Capabilities

Methodology

- Determine Basic Squad Missions
  - Doctrinal pubs
  - Future concepts
  - FMFMs, (FMFM 6-5 Infantry Squad)
- Develop Squad Tasks and align with missions (one-to-one relationship)
  - MCCRES
  - T&R manual
  - SOI POI
  - Lesson's Learned
- Develop capabilities and associate with tasks
- *Validate Hierarchy with operators (missions, tasks, capabilities)*
- Prioritize Conditions
- Apply Conditions
  - Use information from conditions to assist Prioritization of Hierarchy
- Prioritize Hierarchy
- Modify Operating Concept
  - Start with the pictorial development of basic missions
  - Modify based on data collection
  - Apply each mission to an accepted scenario
  - Finalize using prioritized conditions & hierarchy

Squad Tasks from Squad Perspective

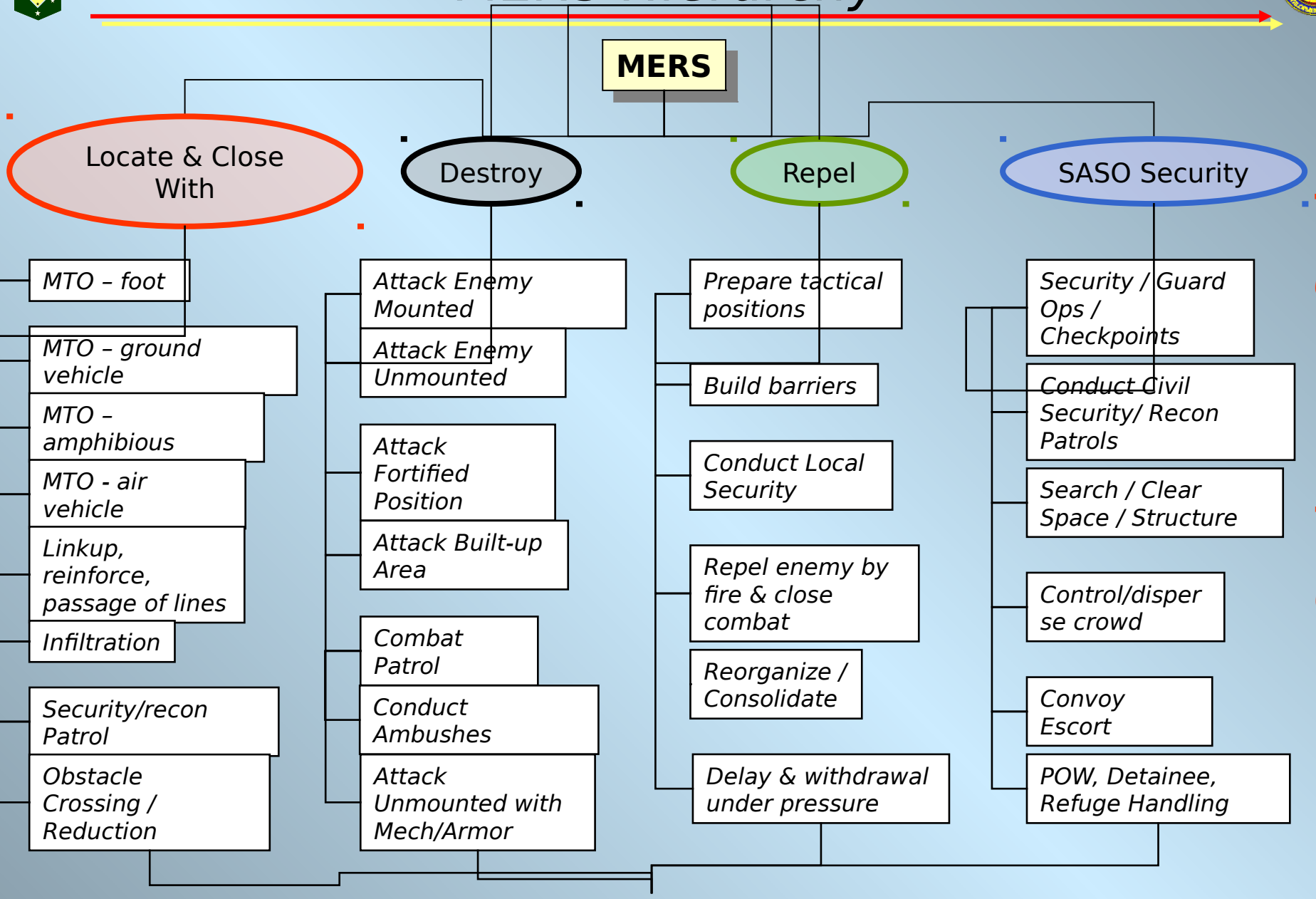


Task	Close	Security	Repel	Destroy
A	X			
B		X		
C				X
D			X	

One-to-one Relationship

- Squad conducts a particular task that is associated with only one mission at any time at any given time
- Squad transitions from one mission to another as an operation proceeds
  - Example: The squad transitions from a task in Close WIth (e.g. movement by foot) to one in Destroy (attack enemy unmounted).
- Rationale: Simplifies the scope of the analytical problem

MERS Hierarchy



Squad Capabilities (Next Charts)

Locate & Close With

Locate & Close With

Squad Mission

MTO – foot

MTO – ground vehicle

MTO – amphibious

MTO - air vehicle

Conduct linkup / passage of lines

Infiltration

Security / recon Patrol

Obstacle Crossing / Reduction

Squad

C2/Intell

- Communicate internal to squad
- Communicate external to squad
- Communicate w/ indigenous population or foreign forces
- Access/Employ Intelligence
- Conduct Mission Analysis & Planning
- Observe/conduct surveillance/recon
- Maintain SA external to squad
- Maintain SA internal to squad
- Tactical Control of the Unit

Fires

- Detect targets
- Classify targets
- Identify targets

Maneuver

- Move unmounted in tactical situation
- Navigate
- Carry supplies & equipment (ammo, food, water, batteries, weapons, etc)

Force Protection

- Protect against environment
- Protect against kinetic projectiles
- Detect and locate mines, IEDs, unexploded ordnance & booby traps
- Protect against non-kinetic weapons effects
- Protect against NBC contamination
- Perform self-aid/buddy aid.
- Reduce signature
- Counter target acquisition
- Employ Deception measures
- Flotation in water

Logistics

- Maintain equipment
- Hydrate the squad
- Nourish the squad
- Generate Power

Training

- Organize training
- Conduct training
- Evaluate training

Squad

Draft Squad Mission, Task, Capability Hierarchy

Squad Tasks

Required Capabilities

Task – Capability Mapping

Types of Combat	Offensive															Defensive						Other Than War					
Operation/HHQ Missions	Locate & Close With								Destroy							Repel						SASO Security					
Squad Tasks	Movement to Objective (foot)	Movement to Objective (ground vehicle)	Movement to Objective (amphibious)	Movement to Objective (air vehicle)	Conduct linkup/passage of lines	Infiltration	Security/reconnaissance patrol	Obstacle Crossing/Reduction	Attack Enemy Unmounted	Attack Enemy Mounted	Attack Fortified position	Attack Built-Up area	Combat Patrol	Conduct Ambushes	Attack Unmounted w Mounted/Armor	Prepare tactical position	Build barriers	Conduct Local Security/Surveillance	Repel enemy by fire & close combat	Reorganization/Consolidation	Delay & withdrawal under pressure	Provide Security/Guard	Conduct civil security / reconnaissance	Clear Space/Structure	Control/disperse crowd	Provide Convoy Escort	POW, Detainee, Refuge Handling
Functional Area (FA) / Required Capability																											
C2/SA	Communicate internal to Squad	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C2/SA	Communicate external to Squad	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C2/SA	Communicate with indigenous population or foreign forces	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C2/SA	Employ intelligence	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C2/SA	Conduct mission analysis & planning	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C2/SA	Observe/conduct surveillance/reconnaissance	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C2/SA	Record information							x	x					x	x	x	x	x		x			x				x
C2/SA	Control Fires organic to the Squad									x	x	x	x	x	x	x				x		x			x	x	x
C2/SA	Control Fires External to the Squad									x	x	x	x	x	x	x				x		x				x	x
C2/SA	Maintain SA about forces external to the squad	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C2/SA	Maintain SA about own squad	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
C2/SA	Tactical Control of the Unit	x	x	x	x																			x	x	x	
C2/SA	Prepare orders, reports, records, overlays																										x
Lethality	Detect targets	x	x																					x	x	x	
Lethality	Classify targets	x	x																					x	x	x	
Lethality	Identify targets	x	x																					x	x	x	
Lethality	Locate/Designate/Acquire targets																							x	x	x	
Lethality	Engage threat to incapacitate with fires organic to the squad																							x	x	x	
Lethality	Engage threat with squad organic fires																							x	x	x	
Lethality	Engage threat with fires not organic to the squad																								x	x	
Lethality	Emplace Mines/Demolitions																										
Mobility	Move unmounted in tactical situation	x																						x	x	x	
Mobility	Move mounted in tactical situation		x	x	x																				x	x	
Mobility	Breach/reduce/clear obstacles								x															x		x	
Mobility	Navigate	x	x			x	x	x		x	x	x	x	x		x			x			x		x	x	x	
Mobility	Carry supplies & equipment (ammo, food, water, batteries, weapons, etc)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x		x	x	x	x	x	x	x
Sustainability	Maintain equipment	x	x	x	x		x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Sustainability	Produce/Collect Potable Water																				x						
Sustainability	Feed the squad																				x						
Sustainability	Generate Power	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Sustainability	Manage supplies									x	x	x	x	x		x		x		x	x	x			x	x	x
Survivability	Protect against environmental conditions	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Survivability	Protect against kinetic projectiles	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Survivability	Detect and locate mines, IEDs, unexploded ordnance & booby traps	x	x			x	x	x	x	x	x	x	x	x		x	x	x	x		x	x	x	x	x		x
Survivability	Protect against non-kinetic weapons effects	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Survivability	Detect & Protect against NBC contamination	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Survivability	Perform self aid/buddy aid.	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Survivability	Reduce signature	x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x	x
Survivability	Construct obstacles														x			x				x	x				
Survivability	Construct field fortifications																x					x					
Survivability	Employ Deception measures	x	x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x		x	

Top 5 Required Capabilities

Req'd Caps DOTMLPF	Sustain & Manage Electric Power Rank: 1 Weight: 30.0	Perform self-aid/buddy aid Rank: 2 Weight: 29.7	IFF Transmission Rank: 3 Weight: 29.4	Maintain SA internal to squad Rank: 4 Weight: 29.4	Protect against environment Rank: 5 Weight: 29.3
Doctrine	Concepts driving requirement for more autonmous more separation	Concepts driving requirement for more autonmous more separation	None	Concepts driving requirement for more autonmous more separation	None
Organizational	None	None	None	None	None
Training	None	Higher degree of training similar to level of SOF teams is needed	None	All members trained to maintain own SA and assist with squad SA	Train ways to minimize exposure &
Materiel	Better batteries, micro power sources, energy efficient equipment (consume less power)	Increased medical capability would require more sophisticated equipment	RFID systems and communications means	Automated information systems that track and display key info about squad (locations, ammo, health, supplies, etc.)	Improve clothing & protective equipment
Leadership & Education	Leaders would need power management education	Leaders need medical management education & new medical care thinking	None	None	None
Personnel	None	None	None	None	None
Facilities	None	None	None	None	None
Lessons Learned	Problem recognized in OIF. DC CD placed	From SOF experiences	Fratricide has been a high level	As squads become more separated in	A few specific items need work,

Gap Analysis

Priority	Required Capability	Benefit Value	Legacy	Program 1	Program 2	Program 3	Program 4
1	**Sustain & Manage Electric Power**	30	40%	20% Solution		10% Solution	
2	**Perform self-aid/buddy aid**	29.7	60%		35%		
3	**IFF Transmission**	29.4	Gap – No solution				
4	**Maintain SA internal to squad**	29.4	30%	15%			43%
5	**Protect against environment**	29.3	90%	No Major Gap – Existing DOTMLPF meets need			
…	Other Required Capabilities	…		…	…	…	…
54	Flotation in a water environment	1.2	100%	No Gap – Existing DOTMLPF meets need			

What Strategy Provides the Biggest Bang for the Buck

3-Model Process Overview

Needs

Task Weighting

Attribute Rating

PIR Rating

Programmatic

Programmatic Objectives Weighting

Programmatic Criteria Weighting

PIR Rating

Gap Analysis

Priority	Required Capability	Benefit Value	Legacy	Program 1	Program 2	Program 3	Program 4
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3	IFF Transmission	29.4	Gap – No solution				
4	Maintain SA internal to squad	29.4	30%	15%			43%
5	Protect against environment	29.3	90%	No Gap – Existing DOTMLPF meets need			
…	Other Required Capabilities	…		…	…	…	…
54	Flotation in a water environment	1.2	100%	No Gap – Existing DOTMLPF meets need			

Benefit Assessment

Optimization

Optimum solution

Possible solution set

Funding constraint

Potential combinations

Benefit Value

Cost of each set in dollars

Funding controls

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RDT&E Funding

$B	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY 05	Tot Prog
Current	$ 12.200	$ 152.800	$ 171.300	$ 139.100	$ 110.100	$ 64.900	$ 65.156	$ 65.409	$ 780.965
DAB MS0	$ 100.000	$ 148.859	$ 155.381	$ 161.548	$ 130.539	$ 60.176	$ 43.771	$ 42.662	$ 842.936
$ 3.0	$ 12.200	$ 152.800	$ 371.000	$ 470.000	$ 515.000	$ 540.000	$ 538.000	$ 410.000	$ 3,009.000

Spending profiles

Must funds/ no funds

Projects selected

Funding shortfalls

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RDT&E LP Results

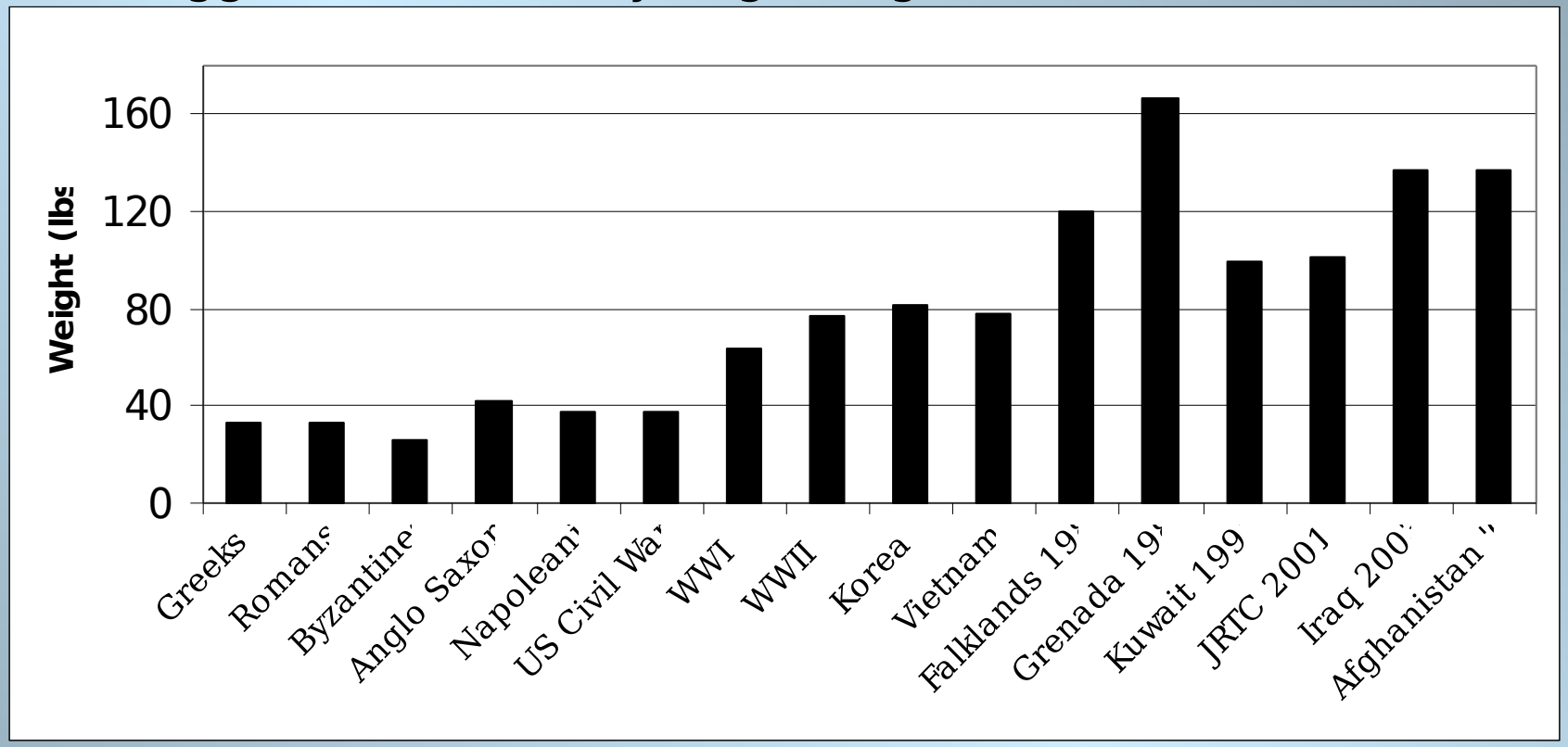
$K	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05	Tot Prog
Current	$ 12.200	$ 152.800	$ 171.300	$ 139.100	$ 110.100	$ 64.900	$ 65.156	$ 65.409	$ 780.965
Selected	$ 12.150	$ 121.388	$ 300.523	$ 462.320	$ 541.979	$ 548.086	$ 508.422	$ 426.122	$ 2,920.992
Delta	$ 50	$ 31.412	$ (129.223)	$ (323.220)	$ (431.879)	$ (483.186)	$ (443.266)	$ (360.713)	$ (2,140.027)
Requested	$ 12.200	$ 152.800	$ 371.000	$ 470.000	$ 515.000	$ 540.000	$ 538.000	$ 410.000	$ 3,009.000
Selected	$ 12.150	$ 121.388	$ 300.523	$ 462.320	$ 541.979	$ 548.086	$ 508.422	$ 426.122	$ 2,920.992
Slack	$ 50	$ 31.412	$ 70.477	$ 7.680	$ (26.979)	$ (8.086)	$ 29.578	$ (16.122)	$ 88.008

Human Systems Integration

- PM MERS Methodology
  - Education
  - Constant Team Focus
  - Expertise from various sources
- Warrior System Integration vice Human Systems Integration?
  - Utilize the principles of HSI
  - User is a Warrior which brings other requirements
  - Warrior has capability to rapidly adapt
- Issues
  - Weight management
  - Integration of equipment into a single ensemble
  - Configuration management
  - Distributed capabilities within the squad
  - Variety of mission profiles continues to increase
  - Multiple mobility platforms
  - High priority on training
  - Legacy habits

Attacking the Marine's Load

- The weight a Warrior carries has been a constant struggle since the very beginning.



- Overloading the infantryman causes fatigue, heat stress, injury, and performance degradation.
- Problem is historical. The ancients offset loads utilizing auxiliary transport (carts, animals, helots) or technology innovation.
- Despite modern day lift technologies (aircraft, wheeled vehicles) the infantryman continues to carry ever increasing loads.

COMBAT LOAD STUDIES

- 15 Sep 2003 - MCCDC Materiel Requirements Division commissioned a study to determine combat load weights: LCdr Economos.
  - Specific goals:

  1- Determine the current 50%-ile body weight for the USMC.

  2- Recommend load weights for load scenarios.

  3- Recommend a combat load weight and balance figure for combat development.
- 2004 – Expeditionary Force Capabilities Assessment Team tasked with gathering data from operating forces deployed in Afghanistan and Iraq. Data collection should be complete in Sept 2004
- 2004-2005 – MCCDC Studies and Analysis Div will review data gathered and provide analysis of weights by billet and by mission profiles of the squad.
- U.S. Army completed a very good load study in Afghanistan last year. (LTC Dean)

Assault Load and Approach March Load - USMC

The **assault load** is the load needed during the actual conduct of the assault. It will include minimal equipment beyond water and ammunition. From the human factors perspective, the maximum assault load weight will be that weight at which an average infantry Marine will be able to conduct combat operations indefinitely with minimal degradation in combat effectiveness.

(REF: ILBE ORD)

The **approach march load** is defined as that load necessary for the prosecution of combat operations for extended periods with access to daily re-supply. The approach march load is intended to provide the individual infantry Marine with the necessities of existence for an extended period of combat. From the perspective of human factors, the maximum weight of the approach march load will be such that the average infantry Marine will able to conduct a 20-mile hike during a time frame of eight hours with the reasonable expectation of maintaining 90% combat effectiveness. (REF: ILBE ORD)

Existence Load, Emergency Approach March Load, Sustained March Load- USMC

- The **existence load** is defined as that load taken from the point of origin into the assembly area. The existence load, for planning purposes, will be intended to support the individual from their pack when immediate re-supply is impossible. From the perspective of human factors, the maximum weight of the existence load will be such that the average infantry Marine will be able to conduct limited movement within the confines of Naval shipping, embark and debark aircraft or amphibious craft, and limited marching from the landing zone into a secured area. (REF: ILBE ORD)

- The US Army FM 21-18 (Foot Marches) pub indicates an **Emergency Approach March Load** scenario. There is no such definition for the Marine Corps. This is a potential deficiency. Suggest the Marine Corps consider adopting a modified version of the Army concept by the following:

  Sustained March Load - that load which may be necessary to accomplish the mission in conditions where approach marches are through terrain impassable to vehicles, or ground/air transport are not available, or when the mission demands that Marines be employed as porters. Heavier packs must be carried and contact with the enemy should not be expected as the load could negatively affect combat effectiveness

- Prescribe weights of:

  48 pounds for the **Fighting Load**

  72 pounds for the **Approach March Load**

  120 pounds for the Emergency Approach March

- The MIL-STD-1472F:

  30% of BW optimum for **Fighting Load**.

  45% of BW optimum for **Approach March Load**.

- FM 21-18 assumes a 160 pound soldier:

  χ lbs soldier x **30%** = **48 lbs** χ = 160 pounds

  χ lbs soldier x **45%** = **72 lbs** χ = 160 pounds

  160 pounds x χ % = 120 lbs/160 lbs; χ = 75%

- 160 lbs (FM 21-18) -v- 171 lbs (LW ORD)?

Optimum Load Carriage Percentages Versus Load Scenarios

REFERENCE	ASSAULT LOAD	APPROACH MARCH LOAD
MIL-STD-1472F	30%	45%
DOD-HDBK-743A	30%	45%
MIL-HDBK-759C	30%	45%
FM 21-18	30%	45%
FM 7-10	30%	45%
Science	30%	45%

Optimum Load Weights For Load Scenarios

Average Marine Body Weight (Male)	Assault (30%)	Approach March (45%)		
169 pounds	50.7 lbs	76.1 lbs		

Recommended % BW for Sustained and Existence Load

- No optimum percentage of body weight defined for a **Sustained March Load** or **Existence Load**. This is a deficiency. *In lieu* of concrete experimentation, it is suggested that the Marine Corps consider **60%** and **75%** as the optimum percentage of body weight for carriage in the Sustained March Load and Existence Load (respectively). These numbers are based on data extrapolation from Army load carriage experiments and derivative conclusions from the Army doctrinal publications.

Optimum Load Weights For Load Scenarios

Average Marine Body Weight (Male)	Assault (30%)	Approach March (45%)	Sustained March (60%)	Existence (75%)
169 pounds	50.7 lbs	76.1 lbs	101.4 lbs	126.8 lbs

Range of USMC body weight %-ile values

3%-ile	5%-ile	25%-ile	50%-ile	75%-ile	95%-ile	97%-ile
123.1 (pounds)	128.9	**152.5**	**169.0**	**185.5**	209.1	214.9

Distributed Capabilities

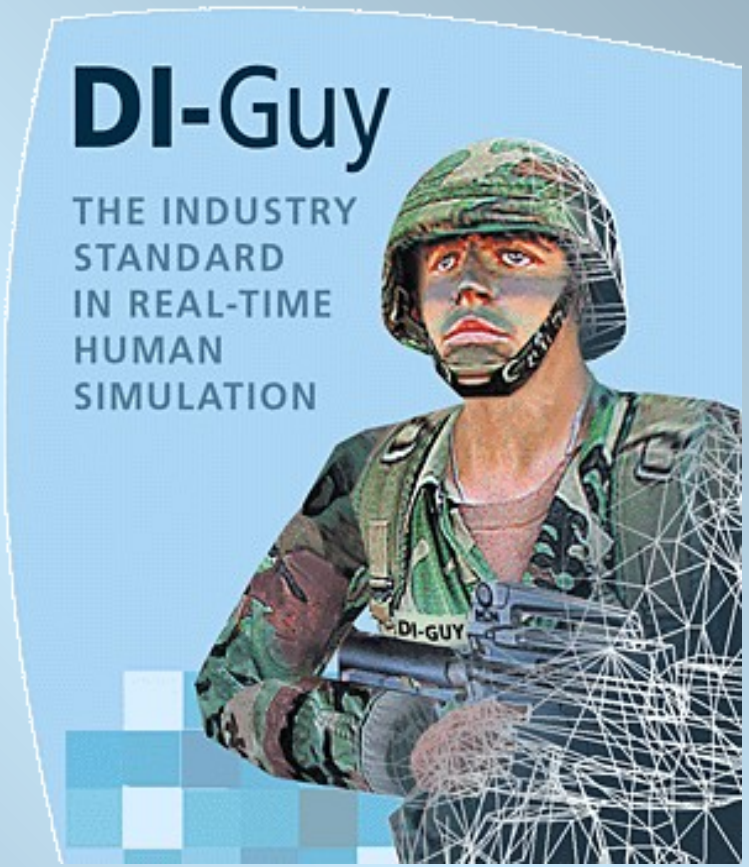
- Distributed capabilities is the only means to effectively reduce the weight of the Marines in the squad.
- There is insignificant weight decrease by focusing on an individual Marine
- Squad as a system is the best method
- Analyze what capabilities are required versus level of redundancy.
- Increases the versatility of the squad
- Example- Designated Marksman
  - One Marine in each squad is assigned a modified M-14 with Bipods and 10 power scope
  - Provides sniper / anti-sniper capability within every Marine Corps Squad

Boston Dynamics

Boston Dynamics is modeling current and near term infantry squad equipment suite to identify integration opportunities, equipment relocation possibilities, and human factor issues for all five billets within the Marine Rifle Squad.

Model of the Marine Squad will be used in the evaluation of the new Assault Load Carriage vest currently being evaluated.

Endstate is to have the model resident within the program office as part of our modeling and simulation effort. TEAMS Dahlgren is our government modeling and simulation agency.



Human Systems Inc

- Small company in Guelph, Canada that has been used extensively by the Canadian Defence Research Establishment in Toronto and the Canadian Army in their Soldier Modernization Program.
  - Valuable amount of corporate knowledge and experience in the modernization of the Infantry
  - Completed numerous experiments with the Canadian Army at Ft Benning MOUT facility and training areas to determine what technologies benefit the soldiers and by what medium it should be presented.
- Familiar with U.S. Marine Corps squad composition
- Endstate in next 12 months is introduction of new components with near term equipment to form the squad prototype equipment ensemble

A Human Factors Method

- Canadian Army Model
  - Human Factors focus. Build upon the base component which is the human body.
  - Use a Human Factors company as your Prime Integrator- HSI
  - Human Factors Experimentation
    - What is the best means of presenting information to a soldier?
    - What are the soldier information requirements?
    - New equipment was designed by DRDC, Queens University, and Human Systems Inc and procured via a Technical Data Package.
    - Example – Extensive research from skin out to include the effect of the uniform, fighting equipment, and load bearing equipment.
      - ✓ Extensive lessons learned from other infantry pack designs
      - ✓ Lab testing to evaluate performance vice personal opinions of soldiers
      - ✓ Pack designer developed TPD for industry to produce
  - Disciplined approach focused on Human Factors

NATO Soldier Modernization and Interoperability Working Group

- Topical Group 1 with the NATO Army Armaments Group (NAAG)
- All nations soldier modernization programs represented by PM's, Requirements Officers, and Research Organizations
- Superb forum to design interoperability into the future infantry systems.
- Overall, a focus on human factors within each country and as members of the working group
- Opportunity to capture lessons learned from the group and not re-invent the wheel. Open invitation from each country to test and trials.
- Limited resources often spur logical issues
  - Not What Technology but Why Technology?

Issues from Data Collection & Conferences

- The MERS program goal is applauded by all Marines interviewed or that participated in the conferences
- Integration of equipment
  - Make it lighter, ergonomically compatible and efficient
  - High technology alone to meet many of the squad's needs was considered a poor substitution for better training with reliable, integrated, less high tech equipment
    - Not every need requires a high tech solution and should be analyzed carefully prior to making that decision
  - However, this should not preclude fielding an advanced technology where appropriate
- Training is an overarching issue that is extremely important across the board
  - The issue of training was echoed by every group of Marines that we interviewed and was repeated at both conferences numerous times
  - The issue of too many non-warfighting requirements placed on Marines impacts on the quantity and quality of the training that squad members receive
  - The lack of realistic training ranges, equipment and facilities result in the development of poor habits that do not translate well in a real combat or operational situation

PM MERS Lessons Learned and Actions

- Many of the multinational soldier modernization programs are funded and driving towards practical solutions with increased similarity to MERS Squad as a System concept.
  - Human Factors approach with technology solutions working for the warfighter is best approach vice approach of Soldier working for Technology
- Conducting data collection and lessons learned from these programs for Technology Harvesting and Trade Studies
  - Fruits of these labors already being observed in potential components effectively enhancing USMC squad capabilities
- Actively engaged with every PM providing material solutions to the squad
  - Socialization of squad as a system is best way to reduce weight and most cost effective means to modernize rifle squads.

Summary

- The Marine Expeditionary Rifle Squad process focuses on the squad as a system
  - Concept development
  - Ownership of the process by key organizations within Marine Corps
  - Best way to integrate equipment is with a focus on human systems integration
  - Best way to compete the squad in the POM process
  - Distributed capabilities is best way to reduce the weight of the squad
  - Technology is not the ultimate solution
  - Leverage the success of other programs
  - Interoperability is essential to the future of warfighting
- Warrior System Integration

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Backup Slides

Sustain & Maintain Electric Power

DOTMLPF	Rank: 1 Weight: 30.0
Doctrine	USMC Concepts driving requirement for more autonomous ops & more separation of units
Organizational	None
Training	None
Materiel	Better batteries, micro power sources, energy efficient equipment (consume less power)
Leadership & Education	Leaders would need power management education
Personnel	None
Facilities	None
Lessons Learned	Problem recognized in OIF. DC CD placed high priority on technical solution
Gap Assessment	Legacy Batteries only solution

Problem

- USMC Concepts are driving the need to employ more comm & other equipment that requires power
- The squad is primarily a foot mobile organization
- Portable Power becomes a more critical need with the increase of electronic systems
- New concepts will be less effective without a solution

Lessons Learned Issue

- Nonstandard, uncoordinated, and ever-increasing requirements for electrical power carried by the infantryman
  - 2/8 OIF After Action Report dated 27 May 2003
  - OIF PEO Soldier Lessons Learned dated 15 May 2003

Solution

- No legacy or program can meet the need
- ONR is conducting power generation research
  - Mainly geared toward vehicle electric power
- Need identified to field a man-packable power source or decrease all the power requirements of squad level equipment

Perform Self-aid/Buddy-aid

DOTMLPF	Rank: 2 Weight: 29.7
Doctrine	Concepts driving requirement for more autonomous ops & more separation
Organizational	None
Training	Higher degree of training similar to level of SOF teams is needed
Materiel	Increased medical capability would require more sophisticated equipment
Leadership & Education	Leaders need medical management education & new medical care thinking
Personnel	None
Facilities	None
Lessons Learned	From SOF experiences
Gap Assessment	First aid pouch & limited First Aid training

Problem

- USMC Concepts & current/future operations are driving the requirement for more autonomous squad operations
- Increased independent operations implies more separation of units
- There will not be enough Corpsman to cover the need
- Increased capability to conduct self/buddy aid necessitates increased training
- Increased training will require more sophisticated medical equipment

Solution

- Legacy program meets partial need
- Initiate integrated program to assess medical needs vis-à-vis increased training

IFF Transmission

DOTMLPF	Rank: 3 Weight: 29.4
Doctrine	None
Organizational	None
Training	None
Materiel	RFID systems and communications means
Leadership & Education	None
Personnel	None
Facilities	None
Lessons Learned	Fratricide has been a high level problem forever
Gap Assessment	None

Problem

- All services have struggled with the Combat ID problem
- Increased SA is a partial solution
- Complete solution requires some type of ID transponder (PFID)

Lessons Learned Issue

- Active and passive combat identification efforts not integrated to support direct-fire decision-making by rifle squads
  - 2/8 letter dated 22 May 2004
  - 7th Marines Lessons Learned
  - OIF PEO Soldier Lessons Learned dated 15 May 2003

Solution

- Joint Combat ID working toward solution
  - Focus is on systems
  - Little work on small unit or individuals
- Increase the focus on small unit in order to field a transponder of some type

Maintain SA internal to squad

DOTMLPF	Rank: 4 Weight: 29.4
Doctrine	Concepts driving requirement for more autonomous ops & more separation
Organizational	None
Training	All members trained to maintain own SA and assist with squad SA
Materiel	Automated information systems that track and display key info about squad (locations, ammo, health, supplies, etc.)
Leadership & Education	None
Personnel	None
Facilities	None
Lessons Learned	As squads become more separated in execution of missions, SA internal becomes extremely hard
Gap Assessment	Voice, PRR

Problem

- USMC Concepts & current/future operations are driving the requirement for more autonomous squad operations
- Increased independent operations implies more separation of units and individuals within the unit
- Squad internal comm equipment was fielded to address the problem
- Lacks integration with helmet, hands free capability, etc

Lessons Learned Issue

- Radio headset causes pain, not integrated with headgear
  - 2/8 letter dated 22 May 2004
  - 7th Marines Trip Report May 2004
  - Field Report, MCSC OIF Equipment Liaison Team dated 20 – 25 April 2003

Solution

- Immediate focus is to make compatible with helmet
- Hands free capability is next
- Integration as a complete head borne system is ultimate

Protect Against Environment

DOTMLPF	Rank: 5 Weight: 29.3
Doctrine	None
Organizational	None
Training	Train ways to minimize exposure &
Materiel	Improve clothing & protective equipment
Leadership & Education	None
Personnel	None
Facilities	None
Lessons Learned	A few specific items need work, but OK for the most part
Gap Assessment	Clothing & Equipment

Problem

- Although identified as a high priority required capability, current fielded clothing & equipment meets most of the need
- Integration of all the separate pieces of equipment the biggest issue

Lessons Learned Issues

- Lack of integrated, single-solution all-environment protective clothing
  - 2/8 OIF AAR 27 May 2004
  - OIF PEO Soldier Lessons Learned dated 15 May 2003
- Lack of protection for neck against ultraviolet radiation, wind, rain, cold, sand, and shrapnel
  - 2/8 letter dated 22 May 2004
  - OIF PEO Soldier Lessons Learned dated 15 May 2003

Solution

- Focus on specific needs addressed by LL
- Ensure integration of entire suite

RANK	DATA SAMPLE (N=)	WT (X=) Pounds	±SD Lbs.	HT (X=) Inches	±SD In.
USMC (Females Only)	4,186	130.3	15.7	64.5	2.6
USMC (Males Only)	**56,513**	**169.0**	**24.4**	**69.6**	**2.9**
O-1,O-2 (“)	108	172.6	22.8	70.1	3.9
E-9 (“)	68	184.2	20.9	70.1	2.9
E-8 (“)	174	182.5	19.8	69.7	2.7
E-7 (“)	385	182.0	20.5	69.7	2.7
E-6 (“)	1,200	172.0	23.7	69.9	2.8
E-5 (“)	3,371	167.1	22.9	69.7	2.7
E-4 (“)	7,567	167.2	23.3	69.6	2.8
E-3 (“)	26,632	169.2	24.4	69.2	3.0
E-2 (“)	12,185	169.3	25.0	69.6	2.8
E-1 (“)	4,823	169.1	25.6	69.7	3.0
OTHER	**SAMPLE (N=)**	**WT (X=)**	**±SD**	**HT (X=)**	**±SD**
OCS	162	173.4	19.5	68.7	2.8
TBS (predominantly O-1 & O-2)	562	175.1	21.3	69.9	3.2
H&S BN(predominantly ≥E-5 & ≥O-3)	1,555	175.2	23.0	69.8	2.7
SOI (MOS 03XX, E-1 & E-2)	223	168.2	19.4	69.5	2.1